CLAIMS

1. A *Brassicaceae* product fermented with lactic acid bacteria, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation for use in promoting health in a human subject.

2. The *Brassicaceae* product of claim 1, wherein the *Brassicaceae* product increases the gastrointestinal level of one or more short chain fatty acids (SCFA) in the human subject.

3. The *Brassicaceae* product of claim 1 or claim 2, wherein the *Brassicaceae* product increases the production of one or more SCFA in the gastrointestinal tract of the human subject.

4. The *Brassicaceae* product of any one of claims 2 to 3, wherein the *Brassicaceae* product increases the production of one or more SCFA in the colon of the human subject.

5. The *Brassicaceae* product of any one of claims 2 to 4, wherein the SCFA is selected from one or more or all of: butyrate, propionate, acetate, formate, isobutyrate, valerate, isovalerate, caproate, formic acid, acetic acid, propionic acid, butyric acid, isobutyric acid, valeric acid, isovaleric acid, and caproic acid.

6. The *Brassicaceae* product of any one of claims 2 to 5, wherein the SCFA is selected from one or more or all of: butyrate, propionate and acetate.

7. The *Brassicaceae* product of any one of claims 1 to 6, wherein the *Brassicaceae* product comprises an isothiocyanate.

8. The *Brassicaceae* product of any one of claims 1 to 7, wherein the *Brassicaceae* product comprises live lactic acid bacteria from *Brassicaceae*.

9. The *Brassicaceae* product of any one of claims 1 to 8, wherein promoting health comprises promoting one or more of: gut health, immune system health, cardiovascular health, central nervous system function, cognition, metabolic health, skeletal health, liver health, blood sugar control and skin health.

10. The *Brassicaceae* product of any one of claims 1 to 9, wherein promoting health comprises treating or preventing one or more symptoms of a condition selected from: diabetes, inflammation, metabolic dysfunction, allergy and cancer.

11. The *Brassicaceae* product of claim 9, wherein promoting gut health comprises reducing or preventing one or more symptoms of a gut health associated condition selected from one or more of: irritable bowel syndrome, inflammatory bowel disease, Crohn's disease, colorectal cancer, gut leakiness, non-alcoholic fatty liver disease, metabolic syndrome, obesity, small intestinal bacterial overgrowth (SIBO), gastroenteritis, gut microbial dysbiosis, reduced gut microbial diversity, antibiotic treatment, post-surgery recovery, food intolerance, diarrhea, gastritis, diverticulitis, flatulence, constipation, functional gut disorders and functional gastrointestinal and motility disorders.

12. The *Brassicaceae* product of any one of claims 1 to 11, wherein promoting health comprises promoting health of the gut microbiome in a human subject.

13. The *Brassicaceae* product of claim 12, wherein promoting health of the gut microbiome comprises one or more of: increasing the level and/or activity of one or more beneficial bacteria, decreasing or maintaining the level and/or activity of one or more non-beneficial bacteria, increasing the resistance of the gut microbiome, increasing the resilience of the gut microbiome, and increasing the diversity of the gut microbiome.

14. The *Brassicaceae* product of claim 13, wherein the beneficial bacteria is lactic acid bacteria.

15. The *Brassicaceae* product of claim 13, wherein the non-beneficial bacteria is a pathogenic strain of *E. coli*.

16. The *Brassicaceae* product of any one of claims 1 to 15, wherein the *Brassicaceae* product does not increase the total level of gastrointestinal bacteria in a human subject.

17. The *Brassicaceae* product of any one of claims 1 to 16, wherein the *Brassicaceae* product comprises a prebiotic or a prebiotic and a probiotic.

18. The *Brassicaceae* product of any one of claims 1 to 17, wherein the *Brassicaceae* product comprises a prebiotic and a probiotic which are synbiotic.

19. A *Brassicaceae* product fermented with lactic acid bacteria, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation for use promoting the health of the gut microbiome in a human subject.

20. A *Brassicaceae* product fermented with lactic acid bacteria, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation for use in treating and/or preventing microbial dysbiosis in the gastrointestinal tract of a human subject.

21. A *Brassicaceae* product fermented with lactic acid bacteria, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation for use in treating and/or preventing inflammation in a human subject.

22. A *Brassicaceae* product fermented with lactic acid bacteria, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation for use in treating and/or preventing inflammation in a human subject.

23. Use of a *Brassicaceae* product fermented with lactic acid bacteria in the manufacture of a medicament for promoting health in a human subject, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation.

24. Use of a *Brassicaceae* product fermented with lactic acid bacteria in the manufacture of a medicament for promoting health of the gut microbiome in a human subject, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation.

25. Use of a *Brassicaceae* product fermented with lactic acid bacteria in the manufacture of a medicament for treating and/or preventing microbial dysbiosis in the gastrointestinal tract of a human subject, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation.

26. Use of a *Brassicaceae* product fermented with lactic acid bacteria in the manufacture of a medicament for treating and/or preventing inflammation in a human subject, wherein the

lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation.

27. Use of a *Brassicaceae* product fermented with lactic acid bacteria in the manufacture of a medicament for treating and/or preventing diabetes in a human subject, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation.

28. The use of any one of claims 23 to 27 wherein the medicament comprises one or more or all of: i) a prebiotic, ii) a prebiotic and a probiotic, and iii) a prebiotic and a probiotic which are synbiotic.

29. A pharmaceutical composition comprising a *Brassicaceae* product fermented with lactic acid bacteria, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation for use in promoting health in a human subject.

30. A pharmaceutical composition comprising a *Brassicaceae* product fermented with lactic acid bacteria, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation for use in promoting health of the gut microbiome in a human subject.

31. A pharmaceutical composition comprising a *Brassicaceae* product with lactic acid bacteria, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation for treating and/or preventing microbial dysbiosis in the gastrointestinal tract of a human subject.

32. A pharmaceutical composition comprising a *Brassicaceae* product fermented with lactic acid bacteria, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation for treating and/or preventing inflammation in a human subject.

33. A pharmaceutical composition comprising a *Brassicaceae* product fermented with lactic acid bacteria, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation for treating and/or preventing diabetes in a human subject.

34. The pharmaceutical composition of any one of claims 29 to 33, wherein the composition comprises one or more or all of: i) a prebiotic, ii) a combined prebiotic and a probiotic, and iii) a prebiotic and a probiotic which are synbiotic.

35. A prebiotic composition comprising a *Brassicaceae* product fermented with lactic acid bacteria, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation, wherein the prebiotic increases the gastrointestinal level of one or more SCFA in a human subject.

36. A combined prebiotic and probiotic composition comprising:

i) a *Brassicaceae* product fermented with lactic acid bacteria, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation; and

ii) live lactic acid bacteria.

37. The composition of claim 35 or claim 36, wherein the composition further comprises an isothiocyanate.

38. The composition of any one of claims 29 to 34, 36 or 37, wherein the composition increases the gastrointestinal level of one or more short chain fatty acids (SCFA) in a human subject.

39. The composition of any one of claims 29 to 38, wherein the *Brassicaceae* product increases the production of one or more SCFA in the gastrointestinal tract of the human subject.

40. The composition of any one of claims 29 to 39, wherein the *Brassicaceae* product increases the production of one or more SCFA in the colon of the human subject.

41. The composition of claim 35 or claims 38 to 40, wherein the SCFA is selected from one or more or all of: butyrate, propionate, acetate, formate, isobutyrate, valerate, isovalerate, caproate, formic acid, acetic acid, propionic acid, butyric acid, isobutyric acid, valeric acid, isovaleric acid, and caproic acid.

42. The composition of claim 35, or claims 38 to 41, wherein the SCFA is selected from one or more or all of: butyrate, propionate and acetate.

43. The composition of any one of claims 34 to 42, wherein the *Brassicaceae* product protects the probiotic during passage through the upper gasterintestinal tract.

44. The composition of any one of claims 29 to 43, wherein the *Brassicaceae* product increases the gastrointestinal level of live lactic acid bacteria in a human subject.

45. The composition of any one of claims 29 to 44, wherein the *Brassicaceae* product does not increase the gastrointestinal level of *E. coli* in a human subject.

46. The composition of any one of claims 29 to 45, wherein the *Brassicaceae* product does not increase the total level of gastrointestinal bacteria in a human subject.

47. The *Brassicaceae* product or composition of any one of claims 1 to 46, wherein the lactic acid bacteria was isolated from a broccoli.

48. The *Brassicaceae* productor composition of any one of claims 1 to 47, wherein the lactic acid bacteria is selected from one or more of the genera selected from: *Lactobacillus, Leuconostoc, Pediococcus, Lactococcus, Streptococcus, Aerococcus, Carnobacterium, Enterococcus, Oenococcus, Sporolactobacillus, Tetragenococcus, Vagococcus* and *Weissella*.

49. The *Brassicaceae* productor composition of any one of claims 1 to 48, wherein the lactic acid bacteria is selected from one or more of: *Leuconostoc mesenteroides, Lactobacillus plantarum, Lactobacillus pentosus, Lactobacillus brevis, Lactococus lactis, Pediococcus pentosaceus, Lactobacillus rhamnosus* and *Pedicoccus acidilacti*.

50. The *Brassicaceae* productor composition of any one of claims 1 to 49, wherein the lactic acid bacteria is selected from:

i) *Leuconostoc mesenteroides*;
ii) *Lactobacillus plantarum*;
iii) *Lactobacillus pentosus*;
iv) *Lactobacillus rhamnosus*;
v) a combination of i) and ii);
vi) a combination of i), ii) and iii); and
vii) a combination of i), ii) and iv).

51. The *Brassicaceae* productor composition of any one of claims 1 to 50, wherein the lactic acid bacteria is selected from one or more of:

i) BF1 deposited under V17/021729 on 25 September 2017 at the National Measurement Institute Australia;

ii) BF2 deposited under V17/021730 on 25 September 2017 at the National Measurement Institute Australia;

iii) B1 deposited under V17/021731 on 25 September 2017 at the National Measurement Institute Australia;

iv) B2 deposited under V17/021732 on 25 September 2017 at the National Measurement Institute Australia;

v) B3 deposited under V17/021733 on 25 September 2017 at the National Measurement Institute Australia;

vi) B4 deposited under V17/021734 on 25 September 2017 at the National Measurement Institute Australia; and

vii) B5 deposited under V17/021735 on 25 September 2017 at the National Measurement Institute Australia.

52. The *Brassicaceae* productor composition of any one of claims 1 to 51, wherein the pre-treating comprises one or more of the following:

i) heating;

ii) macerating;

iii) microwaving;

iv) exposure to high frequency ultrasound waves,

v) pulse electric field processing; and

vi) high pressure processing.

53. The *Brassicaceae* productor composition of claim 52, wherein heating comprises heating the *Brassicaceae* product to about 50˚C to 70˚C.

54. The *Brassicaceae* productor composition of any one of claims 1 to 53, wherein the *Brassicaceae* is selected from *Brassica oleracea, Brassica balearica, Brassica carinata, Brassica elongate, Brassica fruticulosa, Brassica hilarionis, Brassica juncea, Brassica napus, Brassica narinosa, Brassica nigra, Brassica perviridis, Brassica rapa, Brassica rupestris, Brassica septiceps* and *Brassica tournefortii.*

55. The *Brassicaceae* productor composition of claim 54, wherein the *Brassicaceae* is *Brassica oleracea.*

56. Faecal microbiota suitable for transplantation into a human subject, wherein the faecal microbiota has been isolated from a human subject administered a *Brassicaceae* product fermented with lactic acid bacteria, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation.

57. A vehicle for delivering a bioactive to a human subject, wherein the vehicle comprises a *Brassicaceae* product fermented with lactic acid bacteria, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae* and/or the *Brassicaceae* product was pre-treated prior to fermentation.

58. The vehicle of claim 57, wherein the *Brassicaceae* product comprises one or more or all of: i) a prebiotic, ii) a prebiotic and a probiotic, and iii) a prebiotic and a probiotic which are synbiotic.

59. The vehicle of claim 57 or claim 58, wherein the bioactive is selected from one or more or all of:

i) a fatty acid,
ii) oil,
iii) a further prebiotic, and
iv) a further probiotic.

60. The vehicle of claim 59, wherein the fatty acid is selected from an omega-3 or and omega-6 fatty acid.

61. The vehicle of claim 60, wherein the omega-3 fatty acid is selected from one or more or all of: of α-linolenic acid, eicosapentaenoic acid, docosapentaenoic acid and docosahexaenoic acid.

62. The vehicle of claim 60, wherein the oil is selected from one or more of: fish oil, krill oil, marine oil, algal oil, microbial oil, canola oil, crustacean oil, mollusc oil, sunflower oil, avocado oil, soya oil, borage oil, evening primrose oil, safflower oil, flaxseed oil, olive oil, pumpkinseed oil, hemp seed oil, wheat germ oil, palm oil, palm oil, palm kernel oil, coconut oil, medium chain triglycerides and grapeseed oil.

63. The vehicle of claim 62, wherein the fish oil or marine oil is selected from: tuna oil, herring oil, mackerel oil, sardine oil, cod liver oil, menhaden oil, shark oil, squid oil, and squid liver oil.

64. The vehicle of claim 59, wherein the further prebiotic is selected from one or more or all of: fructo-oligosaccharides galacto-oligosaccharide, trans-galacto-oligosaccharides, oligofructose, pecticoligosaccharide, resistant starch, pectin, glucosinolate and inulin.

65. The vehicle of claim 59, wherein the further probiotic comprises one or more probiotics selected from: lactic acid bacteria, *Bifidobacteria, Bacteroidetes, Baciullus, Streptococcus, Escherichia, Enterococcus and Saccharomyces.*

66. The *Brassicaceae* product, composition or vehicle of any one of claims 1 to 59, wherein the *Brassicaceae* product is in a form selected from a: liquid, emulsion, powder, capsule, tablet.

67. A method of preparing a *Brassicaceae* product comprising:
i) fermenting *Brassicaceae* material with lactic acid bacteria;
ii) adding a fatty acid and/or oil before or during step i).

68. The method of claim 67, wherein the method further comprises forming an emulsion or suspension.

69. The method of claim 67 or claim 68, wherein the *Brassicaceae* material is pre-treated.

70. The method of claim 69, wherein the *Brassicaceae* material is pre-treated with heating to about 50˚C to 70˚C.

71. The method of any one of claims 67 to 70, wherein the lactic acid bacteria were derived from an isolate obtained from *Brassicaceae.*

72. An emulsion or suspension produced by any one of claims 67 to 71.

73. A *Brassicaceae* product comprising the emulsion or suspension of claim 72.